



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/613,960	07/03/2003	Olga Bakajin	IL-11046	6753

7590

06/05/2006

James S. Tak  
Assistant Laboratory Counsel  
Lawrence Livermore National Laboratory  
P.O. Box 808, L-703  
Livermore, CA 94551

EXAMINER
----------

MENON, KRISHNAN S

ART UNIT	PAPER NUMBER
----------	--------------

1723

DATE MAILED: 06/05/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	Application No.	Applicant(s)	
	10/613,960	BAKAJIN ET AL.	
	Examiner	Art Unit	
	Krishnan S. Menon	1723	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 22 May 2006.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1,3-15 and 17-46 is/are pending in the application.
- 4a) Of the above claim(s) 20-44 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,3-15,17-19,45 and 46 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |   |   |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                        | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)    | Paper No(s)/Mail Date. _____  |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____   | 6) <input type="checkbox"/> Other: _____                                    |

### **DETAILED ACTION**

Claims 1,3-15 and 17-46 are pending, of which claims 20-44 are withdrawn from consideration, in the RCE of 5/22/06.

### ***Specification***

The amendment filed 5/22/06 is objected to under 35 U.S.C. 132(a) because it introduces new matter into the disclosure. 35 U.S.C. 132(a) states that no amendment shall introduce new matter into the disclosure of the invention. The added material which is not supported by the original disclosure is as follows: The new additions in their entirety is new matter, even if only meant to explain background information to the invention. Such introduction of background information would render support for new and additional process and application/use claims involving the device not contemplated in the specification and claims as originally filed.

Applicant is required to cancel the new matter in the reply to this Office action.

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1,3-15,17-19,45 and 46 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to

Art Unit: 1723

reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The limitations, “elastically compressed”, and “elastically compress” have no supporting disclosure in the specification or claims as originally filed. Figures 1C and 1D may provide disclosure for “compressed”, but not “elastically compressed”.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 4 and 7 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1 recites the carbon nanotubes as compressed by the cover layer, which requires complete filling of the segment with the carbon nanotube mesh. Claims 4 and 7 recite the mesh as ‘without filling the segment’. Thus the limitations in claims 4 and 7 conflict with that of claim 1 from which they depend, and are therefore, indefinite.

Claim 7 depends from claim 5. Claim 5 recites complete filling of the channel segment, claim 7 recites only partial filling of the channel segment to leave a gap in the segment. Thus claims 5 and 7 have conflicting limitations, making claim 7 indefinite.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

1. Claims 1,3-15,17-19, 45 and 46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dai et al (US 2004/0149209) in view of Noca' 810.

Claims 1 and 45: Dai teaches a carbon nanotube mesh comprising a plurality of intertwined free-standing carbon nanotubes (paragraph 4, examples 1 and 2), densely packed (paragraph 68), fixedly attached to a substrate which is useful for separating, concentrating or filtering molecules (paragraphs 44, 2). Dai also teaches the process as claimed in claim 45. However, Dai does not teach the specifics of the structure of the microfluidic channel for the device, such the channel and the cover. Noca teaches the specific structure of the microfluidic channel with cover for use in separation processes (figures 5 and 6, abstract, col 4 line 15 – col 5 line 37). It would be obvious to one of ordinary skill in the art at the time of invention to use the teaching of Noca in the teaching of Dai for the structural details that are missing from the Dai reference for making the device for its intended use. With respect to the 'elastically compressed', the carbon nanotubes in the channel with cover, as taught by the references, can have some degree of inherent compression because they are random grown and densely packed, and the carbon nanotubes can be inherently elastic, like that of the applicant.

Re Claims 3-19, Noca teaches all the structural details as follows:

Claim 3: channel filled with the mesh – see figure 5 at 54.

Claim 4: nanotube mesh without filling the channel – see col 6 lines 45-54 wherein it teaches any size, shape and spacing; which would include partial filling of channel segments. Figures show part of the channels unfilled.

Claims 5 and 6: more than one mesh – see figure 6. complete or partial fill of the nanotubes – see col 6 lines 45-54.

Claim 8 recites intended use. See abstract.

Claims 9-11 – functionalized/derivatized – see col 8 lines 33-47.

Claim 12: pore size, etc – col 5 lines 20-27.

Claims 13 - 15: etched as a groove, cover layer, anodically bonded (conventional MEMS process) – fig 5 and 6, col 10 lines 47-67.

Claim 17: more than one channel – fig 6

Claims 18 and 19: The references do not teach the nubbins as claimed. However, since Dai in view of Noca teach the carbon nanotube mesh (54) as integral with or embedded in the channels (68) (Noca: col 10 lines 47-67), such nubbins become redundant and unnecessary. Ex Parte Wu.

Claim 46: Pressure driven flow is inherent in the device of Dai in view of Noca, even if the references do not specifically teach so. Under the principles of inherency, if a prior art device, in its normal and usual operation, would necessarily perform the method claimed, then the method claimed will be considered to be anticipated by the prior art device. When the prior art device is the same as a device described in the specification for carrying out the claimed method, it can be assumed the device will

Art Unit: 1723

inherently perform the claimed process. In re King, 801 F.2d 1324, 231 USPQ 136 (Fed. Cir. 1986).

### ***Allowable Subject Matter***

Claim 7 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims, and by more clearly defining the structure as - - , the nanotube meshes partially filling the cross-section of the channel segment to form a central gap therethrough, - - , instead of "without filling the channel segment, so as to define a gap therethrough"

The following is a statement of reasons for the indication of allowable subject matter: The closest references, Dai and Noca do not teach the structure claimed in claim 7, which is as depicted in figure 2 of the application. Even though the references teach nanotubes grown at random from surfaces and enclosing such structure to have usable forms as filters, etc., there is no suggestion for the specific structure claimed.

### ***Response to Arguments***

Applicant's arguments filed 5/22/06 have been fully considered but they are not persuasive.

With respect to the new matter rejection, the cited paragraph 28 does not provide disclosure for "elastic compression" of the nanotubes. The cited paragraph only states "unique mechanical strength and elasticity which makes the mesh highly robust"; in

Art Unit: 1723

addition, this paragraph does not provide any information on the mechanical strength or the elasticity of the mesh.

With respect to the argument, “the key is simply that the mesh is densely packed, rather it is the fact that the mesh is packed and elastically compressed by sealably capping the channel ...”, the random nature of the nanotube would have the nanotubes compressed in the reference as well, as claimed, when the channel is filled. There will be no compression only when the nanotubes are made to the exact heights to fill the channel up to the cover, which would not be random growth.

Argument against the 103 rejection of claims 1 and 45 are not persuasive. First of all, the arguments assume matters not disclosed in the original specification or claims. Secondly, the cover of the reference also would inherently ‘elastically compress’ the nanotubes because the random grown nanotubes would at least some degree of over-growth, which would be compressed when covered. Applicant has not provided any evidence to refute this fact.

Argument that ‘...the vertically aligned configuration of Noca ... is inherently incompatible with the elastic compression...’ because ‘...it could jeopardize the integrity...’ is not commensurate with the rejection. Noca reference was used for the channel and cover because Dai does not teach the details of channel and cover for a usable structure for the nanotubes. Noca was not used for its teaching of the oriented nanotubes.

In response to the argument that Dai merely mentions that carbon nanotubes may be used in molecular filtration membranes: the filtering process is well known in the



Art Unit: 1723

art and includes the steps of flowing the molecules through the filter; a teaching of use in molecular filtration would imply such steps. There is no other specific steps in the claim that are novel and unobvious. Under the principles of inherency, if a prior art device, in its normal and usual operation, would necessarily perform the method claimed, then the method claimed will be considered to be anticipated by the prior art device. When the prior art device is the same as a device described in the specification for carrying out the claimed method, it can be assumed the device will inherently perform the claimed process. In re King, 801 F.2d 1324, 231 USPQ 136 (Fed. Cir. 1986).

Arguments with regard to “without filling”: Noca reference teaches channels with portions completely filled and other portions unfilled, which read on the claims.

The cited paragraph of Noca reference, column 6 lines 45-54, teach any shape, size or spacing, which would include complete filling, incomplete filling, and gaps.

Arguments re claims 18 and 19, nubbins: this argument is not persuasive because the reference teaches integral or embedded nanotubes with the channels, and the nubbins are redundant. Applicant has not provided any evidence to support the argument of unobviousness.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Krishnan S. Menon whose telephone number is 571-272-1143. The examiner can normally be reached on 8:00-4:30.

Art Unit: 1723

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wanda L. Walker can be reached on 571-272-1151. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Krishnan S Menon  
Examiner  
Art Unit 1723